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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/807,528	03/23/2004	Takayuki Yamagishi	ASMJP.146AUS	3438

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EXAMINER	
DHINGRA, RAKESH KUMAR	
ART UNIT	**PAPER NUMBER**
1763	

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	01/19/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 01/19/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/807,528	YAMAGISHI ET AL.	
	Examiner	Art Unit	
	Rakesh K. Dhingra	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 May 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) *18-27* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17 and 28* is/are rejected.

7)☒ Claim(s) *8* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's affirmation of election of Group I, claims 1-17 without traverse is acknowledged.

Claim Objections

Claim 8 is objected to because of the following informalities:

In the now amended claim 8, the newly added limitation "each inductor comprising a hollow copper tube" should be underlined.

Appropriate correction is required.

Response to Arguments

Applicant's arguments filed 5/16/06 have been fully considered and response is given hereunder.

1) Applicant has amended claim 8 and added new claim 28.

2) Rejection of Claims 1-5, 6, 9, 14-17 under 35 USC 103 (a): Applicant's argument regarding Murata reference not teaching about plate type electrode is not found persuasive, since Murata does teach that heater 34 (lower electrode) is disposed in parallel to the ladder-shaped electrode 32 for plasma discharge generation. Further, ladder shaped electrode 32 is plate shaped (Figure 2). Thus Murata reference teaches claim limitations in this respect and the rejection is maintained. However applicant's clarification regarding claim limitation pertaining to equal characteristic impedance in each of multiple branches adjusted by a removable adjuster, not being taught by the prior art references is found persuasive and the rejection is withdrawn. However on further consideration new ground of rejection is made in view of new reference (US Patent No. 5,195,045 – Keane et al) that when combined with Murata et al and (Blonigan et al (US PGPUB No. 2002/0046989) reads on claim 1 limitations. Accordingly claims 1-6, 9, 14-17 have been rejected under 35 USC 103 (a) as explained below. Further, remaining claims 7, 8, 10-13, 28 have also been rejected under 35 USC 103 (a) as explained below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-6, 9, 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murata et al (US Patent No. 6,363,881) in view of Blonigan et al (US PGPUB No. 2002/0046989) and Keane et al (US Patent No. 5,195,045).

Regarding Claims 1,2,4,5,15,16: Murata et al teach a plasma treatment apparatus (Figures 1, 2, 4) for thin-film deposition comprising:

a reactor chamber 31;

a pair of electrodes 32, 34 (including ladder electrode 32 –plate shaped) disposed in parallel inside the chamber for glow discharge generation and between which a thin film is to be formed on a substrate 33; and

a radio-frequency power supply system used for transmitting radio-frequency power to electrode 32 via multiple supply points 44-51 provided on the electrode 32,

said radio-frequency power supply system comprises:

a radio-frequency power source 36; and

a radio-frequency transmission unit (impedance matching device 35, power distributor 60 and impedance converters 61a-61h) for transmitting radio-frequency power from the radio-frequency power source 32 to the multiple supply points 44-51 of the electrode 32;

said radio-frequency transmission unit comprising:

an inlet transmission path (from high frequency power source 36 upto power distributor 60) and coaxial cables (multiple branches) 41a-h branched off from the inlet transmission path, wherein each branch connected to the supply point 44-51of the electrode 32 is multiple branchings (2x4 = 8) downstream of the inlet transmission path (Figures 1-3 and Column 7, line 3 to Column 8, line 25).

Murata et al also teach impedance converters (inductance adjuster) 61a-61h in each of the branches going to current introducing terminals 42a-h to achieve impedance matching among power distributor 60, coaxial cables 43a-h, and the electrode 32 (for equalizing characteristic impedance in each line) [Column 8, lines 25-40].

Murata et al teach impedance converters in each branch, but do not teach inductance adjusters that are removably installed and that render the characteristic impedance in each branch to be equalized.

Blonigan et al teach a plasma apparatus (Figures 1-3) that comprises a power supply system 50 which includes a matching network 400 having an inductor 240 and capacitors 203-217 connected via conductive straps 402a-402h to multiple points on showerhead (electrode) 122, through a backing (metal) plate 126. Blonigan et al further teach that each strap can be removably connected by the user to one of several locations like 280A, 280B, 280C through a stud and screw arrangement. Blonigan et al also teach that required capacitor values are pre-determined experimentally to obtain proper impedance matching between chamber 133 and the power supply system 410 (Paragraphs 0021-0028).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use selectable capacitor values at selected locations (removable) on the electrode as taught by Blonigan et al in the apparatus of Murata et al to improve uniformity of deposited film on large sized substrates (Paragraph 0011).

Murata et al in view of Blonigan et al teach impedance adjusting capacitors in each branch for supplying power to multiple points on the electrode, but do not teach inductance adjusters that render the characteristic impedance in each branch to be equalized.

Keane et al teach an impedance matching apparatus (Figures 2, 2A) that comprises an impedance matching network 220 which includes variable capacitors 231, 232 and an inductor 226 in a pi. circuit configuration. Keane et al also teach that for capacitive loads, in order to control characteristic impedance over a large range of load impedance values, capacitor 232 is removed and fixed inductor 226 is replaced by a variable inductor 232a (inductance adjuster) [column 28, line 61 to column 30, line 15]. Further, it would be obvious to use adjustable (variable) inductors in each branch to enable control characteristic impedance of each branch.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use variable inductors (inductance adjuster) in place of capacitors as taught by Keane et al in the apparatus of Murata et al in view of Blonigan et al enable control (includes equalize) characteristic impedance in each branch for capacitive loads (parallel plate plasma apparatus).

Regarding Claim 3: Murata et al teach (Figure 2) that each branch 43a-h connected to the multiple supply points 44-51 is two branchings downstream (Figure 3) of the inlet transmission path, and four branches (43a-d and 43e-h) are connected to the multiple supply points 44-51 (Column 8, lines 5-25).

Regarding Claim 6: Murata et al teach that impedance converter (inductance adjuster) 61a-h comprises of ferrite core (Figure 7 and column 8, lines 30-40).

Regarding Claim 7: Murata et al teach that impedance converters (inductors) 61a-h enable to achieve impedance matching between power distributor 60, coaxial cables 43a-h and electrode 32 (substantially equal impedance {includes inductive reactance} values in branches) [Murata et al, Figure 2 and Column 8, lines 25-40]. Further, Blonigan et al teach that the apparatus (Figures 1-3) includes a power supply system 50 that includes inductor 240 and supplies power at multiple points on showerhead (electrode) 122 through a backing (metal) plate 126 (Paragraphs 0022, 0025-0026).

Regarding Claim 9: Murata et al teach that power distributor 60 has a frequency of 30 MHz to 200 MHz (about 27.12 MHz or higher]) {Column 5, lines 55-60}.

Regarding Claims 14, 17: Murata et al teach cable 59 (Figure 2) connected between impedance matching network 35 and power distributor 60 but do not explicitly disclose it to be coaxial cable. But since Murata et al teach all other cables 41a-h, 43a-h to be coaxial cables, cable 59 would also be a coaxial cable due to high frequency power applications (Column 7, lines 55-68).

Claims 8, 11 are rejected under 35 U.S.C. 102(b) as being unpatentable over Murata et al (US Patent No. 6,363,881) in view of Blonigan et al (US PGPUB No. 2002/0046989) and Keane et al (US Patent No. 5,195,045) as applied to Claims 6, 7 and further in view of MacGaffigan (US Patent No. 5,182,427).

Regarding Claims 8, 11: Murata et al in view of Blonigan et al and Keane et al teach all limitations of the claim (as explained above under claim 1) including the transmission unit comprising a metal plate 126 and that impedance converters (inductors) 61a-h comprise ferrite core of circular ring shape (Murata et al, Figure 7) that enable to achieve impedance matching between power distributor 60, coaxial cables 43a-h and electrode 32 (substantially equal impedance values in branches).

Murata et al in view of Blonigan et al and Keane et al do not teach details of inductance adjuster that is, each inductor comprising a hollow copper tube and the ferrite core can be inserted/attached into

the hollow copper tube to adjust an impedance value of the transmission system by selecting the number of ferrite cores to be inserted/attached.

MacGaffigan teach an apparatus (Figures 1-5) comprising a ferrite copper tube 22 in which ferrite beads 16 (ferrite cores) can be inserted and by controlling the number of beads16 (cores), the impedance of the apparatus can be adjusted (like an impedance adjuster). Further, it would be obvious to use the arrangement of copper tube with ferrite cores could be used in multiple branches to enable control impedance on an incremental basis (column 16, line 40 to column 17, line 25).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use hollow copper tube with ferrite cores whose number can be selected as taught by MacGaffign in the apparatus of Murata et al in view of Blonigan et al and Keane et al and to enable obtain easy and incremental impedance adjustment with high frequency power sources (column 5, lines 14-45).

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murata et al (US Patent No. 6,363,881) in view of in view of Blonigan et al (US PGPUB No. 2002/0046989) and Keane et al (US Patent No. 5,195,045) as applied to Claim 1 and further in view of Parsons (US Patent No. Patent No. 6,884,635).

Regarding Claim 10: Murata et al in view of Blonigan et al and Keane et al teach all limitations of the claim except rotational symmetery of connection points.

Parsons teach an apparatus (Figures 1, 2) that includes a master oscillator (power supply system) 210 that supplies power to plurality of electrode segments 62a, 62b----62n at multiple points and where the segments (connection points) are in rotational symmetry with respect to center of electrode surface (Abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use rotational symmetry of connection points as taught by Parsons in the apparatus of Murata et al in view of Blonigan et al and Keane et al to provide uniform plasma density.

Regarding Claim 28: Murata et al teach that supply terminal 44-51 are disposed in the vicinity of outer periphery of electrode 32 (Figure 2).

Claims 12, 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murata et al (US Patent No. 6,363,881) in view of in view of Blonigan et al (US PGPUB No. 2002/0046989) and Keane et al (US Patent No. 5,195,045) as applied to Claim 1 and further in view of DeOrnellas et al (US Patent No. 6,190,496).

Regarding Claims 12,13: Murata et al in view of Blonigan et al and Keane et al teach all limitations of the claim except second radio frequency power source.

DeOrnellas et al teach an apparatus (Figure 1) that includes a reactor chamber 22, an upper electrode grounded electrode 24 and a bottom electrode 28 that is connected to a first high frequency power supply 30 and also a second power supply 32 where the power supply 32 is operated at 450KHz (Column 2, line 65 to Column 3, line 30.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use second power source connected to plasma electrode as taught by DeOrnellas et al in the apparatus of Murata et al in view of Blonigan et al and Keane et al to enable better plasma density control (Column 3, lines 30-40).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Rakesh Dhingra

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